

GODNEV, I. N.

USSR/ Physical Chemistry - Thermodynamics. Thermochemistry 3-8  
Equilibrium. Physicochemical Analysis. Phase Transitions.

Abs Jour : Referat Zhur - Khimiya, No 3, 1957, 7432

Author : Lukomskiy, Yu.Ya. and Godnev, I.N.

Inst : Ivanovsk Institute for Chemical Technology

Title : Formulas for the Heat Capacity of Nitric Oxides Over a  
Broad Range of Temperatures

Orig Pub : Tr. Ivanovsk. Khim.-tekhnol. in-ta, 1956, Vol 5, 43-45

Abstract : Formulas have been obtained for the calculation of the  
heat capacities of NO(I), N<sub>2</sub>O (II), and NO<sub>2</sub> (III) over  
a wide range of temperatures, based on spectroscopic  
data. The formulas are expressed in the form  $C_p = C_{Fo} -$   
 $(\dots / T^2 + aT + bT^2$ , where  $\dots$  is the vibrational  
frequency and  $\dots$  is the Einstein function for one degree  
of freedom. The last two terms express the correction  
for anharmonicity and other deviations from the model of  
the rigid rotator and the harmonic vibrator.

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USSR/ Physical Chemistry - Thermodynamics. Thermochemistry. B-8  
Equilibrium. Physicochemical Analysis. Phase Transitions.

Abs Jour : Referat Zhur - Khimiya, No 3, 1957, 7432

For I  $C_{po} = 7/2R$ ,  $\nu_1 = 1892$  (1),  $a = 0.68 \times 10^{-4}$ ,  $b = 0$ ;  
for II  $C_{po} = 7/2R$ ,  $\nu_1 = 1289$  (1),  $\nu_2 = 593$ , (2),  
 $\nu_3 = 2238$  (1),  $a = 0.185 \times 10^{-3}$ ,  $b = 0.975 \times 10^{-7}$ ; for III<sup>3</sup>  
 $C_{po} = 4R$ ,  $\nu_1 = 1319$  (1),  $\nu_2 = 749$  (1),  $\nu_3 = 1621$  (1),  
 $a = 0.7 \times 10^{-4}$ ,  $b = 0$  (the frequencies are expressed in  
cm<sup>-1</sup> and the number in parentheses indicates the degree  
of degeneracy). The constants a and b for I and II are  
calculated by the least squares method from exact values  
of the heat capacities; the constant a for III is calcula-  
ted from the approximate values of the anharmonicity coef-  
ficients, calculated from the values of the same coeffici-  
ents of other molecules by analogy. For I the maximum de-  
viation is 0.5 percent (300-5,000°K) and for II, 0.2 per-  
cent (300-1500°K). The above-presented formulas are con-  
siderably more accurate than the usual formulas of the  
series type.

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USSR/Thermodynamics. Thermochemistry. Equilibria. Physico-  
Chemical Analysis. Phase Transitions.

B- 8

Abs Jour : Ref Zhur - Khimiya, No 8, 1957, 26082

Author : I.N. Godnev, A.S. Sverdlin  
Title : Equilibrium of Dichlorobenzene Isomers.

Orig Pub : Zh. fiz., khimii, 1956, 30, No 5, 1185.

Abstract : The equilibrium constants and the composition of the equilibrium mixtures at 298, 16, 600 and 800°K were computed for the reactions  $n\text{-C}_6\text{H}_4\text{Cl}_2 (\text{gas}) \rightleftharpoons m\text{-C}_6\text{H}_4\text{Cl}_2 (\text{gas})$  and  $n\text{-C}_6\text{H}_4\text{Cl}_2 (\text{gas}) \rightleftharpoons o\text{-C}_6\text{H}_4\text{Cl}_2 (\text{gas})$  on the basis of bibliographic data (Godnev, I. N., Sverdlin, A.S., Zh. fiz. khimii, 1950, 24, 670; RZhKhim, 1955, 9177).

Card : 1/1

Godnev, I. N.  
AUTHORS: Godnev, I. N., Sverdlin, A. S. and Ushanova, N. I.

TITLE: Calculation of the Normal Vibration Frequencies and  
of Thermodynamic Functions of Germanium Tetraiodide.  
(Vychisleniye chastot normal'nykh kolebaniy i  
termodinamicheskikh funktsiy chetyrekhiodistogo  
germaniya.)

PERIODICAL: Optika i Spektroskopiya, 1957, Vol.II, Nr.6,  
pp. 704-709. (USSR)

ABSTRACT: This paper reports approximate calculation of the  
normal vibration frequencies for germanium tetraiodide  
( $\text{GeI}_4$ ). These frequencies were calculated by extra-  
polation of the coefficients of induction (vliyaniya)  
of the molecules  $\text{GeF}_4$ ,  $\text{GeCl}_4$  and  $\text{GeBr}_4$ . From the  
dependence of the reduced induction coefficients for  
the above three molecules on the equilibrium bond  
lengths the coefficients of induction for  $\text{GeI}_4$  were  
calculated. The results are given in Table 2. The  
mean values of the normal frequencies of  $\text{GeI}_4$  were  
found to be: 171, 60, 276 and 87  $\text{cm}^{-1}$ . This method

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51-6-4/26

Calculation of the Normal Vibration Frequencies and of  
Thermodynamic Functions of Germanium Tetraiodide.

was checked by applying it to the molecule of  $\text{SiI}_4$ . This was done by extrapolation of the inductions coefficients for  $\text{SiF}_4$ ,  $\text{SiCl}_4$  and  $\text{SiBr}_4$ . The calculated results for  $\text{SiI}_4$  are given in Table 4. Comparison of the calculated values for the normal frequencies of  $\text{SiI}_4$  with those obtained experimentally (Refs.15, 21) shows that the error does not exceed  $20 \text{ cm}^{-1}$  for the two higher frequencies of 168 and  $405 \text{ cm}^{-1}$ . For the  $\text{SiI}_4$  frequencies of 63 and  $94 \text{ cm}^{-1}$  the error was only  $10 \text{ cm}^{-1}$ . The present authors conclude that the results of Jolly and Latimer (Ref.1) are incorrect. The latter two authors used Hildebrand's method (Ref.2) and obtained results which are considerably too low. Thermodynamic functions for  $\text{GeI}_4$  are given in Table 6. They were calculated assuming harmonic vibrations and a rigid rotator model. There is 1 figure, 6 tables and 24 references, 9 of which are Slavic.

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01-0-4/26

Calculation of the Normal Vibration Frequencies and of  
Thermodynamic Functions of Germanium Tetraiodide.

ASSOCIATION: Ivanovo Chemico-technological Institute.  
(Ivanovskiy khimiko-tekhnologicheskii institut).

SUBMITTED: November 19, 1956.

AVAILABLE: Library of Congress.

Card 3/3

SCV/51-5-5-11/23

AUTHORS: Ushanova, N.I., Godnev, I.N. and Orlova, I.V.

TITLE: Normal Vibration Frequencies and Thermodynamic Functions of Titanium Tetraiodide (Chastoty normal'nykh kolebaniy i termodinamicheskiye funktsii chetyrekhyodistogo titana)

PERIODICAL: Optika i Spektroskopiya, 1958, Vol 5, Nr 5, pp 567-570 (USSR)

ABSTRACT: The present paper reports an approximate calculation of normal vibration frequencies and thermodynamic functions of  $TiI_4$  using the method described in Refs 1, 2. The equilibrium distance  $r_0$  between Ti and I in  $TiI_4$  is not known. It may be calculated approximately using the covalent radius method of Ref 3. Using the known distances Ti--Cl and Ti--Br in  $TiCl_4$  and  $TiBr_4$ , and the covalent radii of Cl and Br a value of 1.17-1.22 Å was obtained for the radius of Ti. Assuming the covalent radius of I to be 1.33 Å the authors found  $r_0$  between Ti and I to be 2.50-2.55 Å. The mean value of  $r_0 = 2.52$  Å was used in the present paper. This method of calculation of  $r_0$  was checked by finding the dimensions of Ge halides (Table 1). It was found that although the calculated values of the dimensions of  $GeF_4$  and  $GeCl_4$  departed

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SOV/51-5-5-11/23

## Normal Vibration Frequencies and Thermodynamic Functions of Titanium Tetraiodide

considerably from the experimental values, the calculated value for  $\text{GeI}_4$  (2.55 Å) was within 0.05-0.07 Å of the experimental value. This was taken as confirmation that  $r_0 = 2.52$  Å for the Ti-I distance is approximately correct. Using experimental values of frequencies the authors calculated reduced induction coefficients for  $\text{TiCl}_4$  and  $\text{TiBr}_4$  using equations given by Sverdlin (Ref 1). These induction coefficients are given in Table 2. Using the results of Table 2 the authors calculated reduced induction coefficients for  $\text{TiI}_4$  for the following values of  $r_0$ : 2.47, 2.52 and 2.57 Å (Table 3). Using the calculated induction coefficients of  $\text{TiI}_4$  the authors deduced normal vibration frequencies (Table 4). Using the value  $r_0 = 2.52$  Å and the normal vibration frequencies of  $\text{TiI}_4$ , as given in Table 4, the authors calculated thermodynamic functions on the assumption of harmonic vibrations and rigid rotations. These thermodynamic functions are given for gaseous  $\text{TiI}_4$  at 1 atm pressure in Table 5. To estimate the largest possible error the authors calculated the thermodynamic functions at 298.2 and

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SOV/51-5-5-11/23

Normal vibration frequencies and Thermodynamic Functions of Titanium Tetraiodide

1000% for the extreme values of the frequencies and for values of  $r_0$  ranging from 2.47 to 2.57 Å (Table 6). The largest errors in thermodynamic functions were of the order of 1.5-2.0 cal/deg per mole. There are 6 tables, 1 figure and 15 references, 7 of which are Soviet, 2 English, 2 American, 1 German, 1 Japanese, 1 Belgian and 1 translation

SUBMITTED: December 31, 1957

Card 3/3 1. Titanium iodide--Spectra 2. Titanium iodide--Thermodynamic properties

AUTHORS: Godnev, I. E. Godnev, R. A. SOV, 76-32-7- 0 11

TITLE: A Contribution to the Theory of the Heat Capacity of a Poly-atomic Non-Associated Liquid (K teorii teploemkosti mnogatomnoy neassotsirovannoy zhidkosti)

PERIODICAL: Zhurnal fizicheskoy khimii, 1958, Vol. 32, No. 7, pp. 1586-1590 (USSR)

ABSTRACT: Continuing a previous paper in which the equation for  $C_v$  had been obtained, which, however, at medium temperatures represents the upper limit of  $C_v$  (see the diagrams according to Staveley (Ref 16)) and thus, might supply too high results, a precision of this equation is carried out in the present paper. Under the assumption of the energy being a quadratic function it is assumed that the potential energy of the rotational and translational motion  $u = 3N_0 + 3N_0 f$  contains quadratic terms,  $f$  changing within the interval 0 to 1, and the kinetic energy  $t = 6N_0$  containing quadratic terms.  $f = 0$  corresponds to free rotation and  $f = 1$  to the complete hindrance. Based on the generalized theorem on the equal distribution of energy under the assumption that with

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SOV/76-32-7- 0 1

A Contribution to the Theory of the Heat Capacity of a Polyatomic Non-Associated Liquid

the temperature  $\xi$  does not considerably change, the equation is given the form  $C_v = 4,5R + 1,5R\xi + C_{osc}$ . The value  $C_{osc}$  is calculated according to the known formula by Einstein (Refs 28, 29). The magnitude  $\xi$  may, according to the papers by Pitzer (Ref 23), Hildebrandi (Ref 24) and Halford (Ref 25), as well as by Staveley (Ref 26) and Bondi (Ref 27), be calculated by way of the evaporation entropy. A diagram for  $CCl_4$ ,  $CHCl_3$  and  $C_6H_6$  is given with the data supplied by B. I. Stepanov (Ref 37), as well as Pitzer and Scott (Ref 38) being used for the calculation of the value of  $\xi$ . Also calculations by the example of other hydrocarbons were carried out and it was found that the data supplied by V. Ya. Kurbatov (Ref 33) do by far not agree with the  $C_v$  values obtained by Rossini (Ref 44) and Riedel (Ref 40). There are 1 figure, 4 tables, and 44 references, 15 of which are Soviet.

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307/76-32-7-20.45  
A Contribution to the Theory of the Heat Capacity of a Polyatomic Non-Associated Liquid

ASSOCIATION: Ivanovskiy khimiko-tekhnologicheskii institut  
(Ivanovo Chemical and Technological Institute)

SUBMITTED: March 12, 1957

1. Liquids—Thermodynamic properties
2. Liquids—Theory
3. Mathematics

Card 3/3

24(7)

AUTHORS: Orlova, I.V. and Godnev, I.N.

SOV/51-6-4-6/29

TITLE: On the Connection Between the Larnaudie Method and the Yel'yashevich--Stepanov Method of Zero Approximations (O svyazi metoda Larnodi i metoda nulevykh priblizheniy Yel'yashevicha i Stepanova)

PERIODICAL: Optika i Spektroskopiya, 1959, Vol 6, Nr 4, pp 447-449 (USSR)

ABSTRACT: Larnaudie (Ref 1) has recently described an approximate method of calculation of frequencies and force constants of molecules: this he called the "progressive rigidity" method. Transformation of the Larnaudie equations into time equations of Yel'yashevich shows that the Larnaudie method is one of the variants of the zero approximation of Yel'yashevich and Stepanov (Refs 2, 3). Application of the Larnaudie method yields approximate equations for calculation of force constants; they are Eqs (18)-(20) in the text. These equations were used to find the force constants of  $CF_4$ . The results are given in col. 2 of a table on p 229; they agree well with Stepanov's exact values shown in Col. 3 and taken from Refs 2, 10. There are 1 table and 10 references, 7 of which are Soviet, 2 English and 1 French.

SUBMITTED: March 31, 1958  
Card 1/1

24(7)

SOV/51-5-5-4/74

AUTHORS: Gednev, I.M. and Orlova, E.V.

TITLE: The Relationship Between the Kinematic Coefficient Matrix with the Reciprocal Matrices of Kinetic Energy in the Problem of Molecular Vibrations (O svyazi matritsy kinematicheskikh koefitsientov s obratnymi matritsami kineticheskoy energii v zadache o kolebaniyakh v molekule)

PERIODICAL: Optika i Spektroskopiya, 1969, Vol. 6, No. 5, pp 533-536 (USSR)

ABSTRACT: The authors discuss the use of Lagrange's equations, from which holonomic constraints are not excluded, in solution of the problem of molecular vibrations in dependent coordinates. Formulae are deduced which relate the kinematic coefficient matrix  $A$  with the matrices  $T^{-1}$  and  $T_0^{-1}$ , where  $T$  and  $T_0$  are the kinetic energy matrices for dependent and independent coordinates respectively. The paper is entirely theoretical. There are 1 appendix and 7 references, 6 of which are Soviet, 1 English and 1 German.

SUBMITTED: July 2, 1968  
Card 1/1

SOV/51-7-2-27/34

AUTHORS: Godnev, I.N., Aleksandrovskaya, A.M. and Rigina, I.V.

TITLE: Frequencies of Normal Vibrations of Zirconium Halides (Chastoty normal'nykh kolebaniy galogenidov tsirkoniya)

PERIODICAL: Optika i spektroskopiya, 1959, Vol 7, Nr 2, pp 271-273 (USSR)

ABSTRACT: Calculation of frequencies of normal vibrations of  $TiI_4$  was reported earlier (Ref 1). The present paper describes solution of a similar problem for zirconium halides. The authors used curves of the reduced induction coefficients plotted as a function of the atomic weight of the central atom; these curves were constructed separately for fluorides, chlorides, bromides and iodides. The interatomic distances were determined, as in Ref 1, by plotting the dependence of these distances as a function of the atomic number  $Z$  of the peripheral atom; the curve for zirconium halides was drawn above the  $SnX_4$  curve through a point  $r = 2.33 \text{ \AA}$  which represents the Zr-Cl interatomic distance in  $ZrCl_4$ . The interatomic distances  $r$  found in this way are listed in Table 1. Table 2 gives the calculated induction coefficients for  $ZrCl_4$ ,  $ZrBr_4$  and  $ZrI_4$ . The normal vibrational frequencies of the four halides  $ZrCl_4$ ,  $ZrBr_4$ ,  $ZrI_4$  and  $ZrF_4$  found using the coefficients of Table 2 and equations given

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Frequencies of Normal Vibrations of Zirconium Halides

SOV/51-7-2-27/34

earlier (Ref 1) are listed in Table 3. For  $ZrF_4$  the method used requires extrapolation of the induction coefficients and, therefore, it gives only the limits between which lie the normal vibrational frequencies  $\nu_1$ ,  $\nu_2$  and  $\nu_4$  of this compound. The errors in the calculated frequencies of  $ZrCl_4$ ,  $ZrBr_4$  and  $ZrI_4$  are estimated to be  $\Delta\nu_1 = \pm 20$ ,  $\Delta\nu_2 = \pm 10$ ,  $\Delta\nu_3 = \pm 30$  and  $\Delta\nu_4 = \pm 10$   $cm^{-1}$ . The method described was checked by calculating the normal vibrational frequencies of  $SiCl_4$ ,  $SiBr_4$  and  $SiI_4$  (see Table 4 for data on  $SiCl_4$ ). The calculated and experimental values of the  $SiCl_4$  frequencies were found to agree within 1-7  $cm^{-1}$ , except for  $\nu_3$  where the difference was 25  $cm^{-1}$ . In the case of zirconium halides the calculated frequency  $\nu_1 = 382$   $cm^{-1}$  for  $ZnCl_4$  also agrees well with the experimental value of 383  $cm^{-1}$ . There are 4 tables, 1 figure and 11 references, 4 of which are Soviet, 6 English and 1 French.

SUBMITTED: February 23, 1959

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ALASKA, Alaska, U.S.; Alaska, U.S.; Alaska, U.S.

Normal vibration group ... lead halides. Opt. 1 spectr. 7  
no. 6:844-846 D 159. (M.L. 1:1)  
(Lead halides—Spectra)

S/051/60/008/02/006/007  
E201/E391

AUTHORS: Rigina, I.V. and Godnev, I.N.

TITLE: On the Theory of Application of Dependent Coordinates  
in the Problem of Molecular Vibrations

PERIODICAL: Optika i spektroskopiya, 1960, Vol 8, Nr 2,  
pp 171 - 175 (USSR)

ABSTRACT: Recently, Gold, Dowling and Meister (Ref 1) described  
calculation of rotational-vibrational spectra of multi-  
atomic molecules using a method of transforming independent  
into dependent coordinates, which gives amplitude equations  
with singular matrices. The present authors show that  
the use of such equations is not essential and they derive  
more general equations from Lagrange's equations with  
constraints (cf. Ref 2). Such general equations are  
useful in discussions of molecular vibrations in dependent  
coordinates. The paper is entirely theoretical.  
There are 2 mathematical appendices and 11 references, <sup>7</sup>  
of which are Soviet, 3 English and 1 German.

DATE: May 11, 1959

Card 1/1

ALEKSANDROVSKAYA, A.M.; GODNEV, I.N.

Tentative orientation prediction of normal vibration frequencies  
of hafnium halides. Opt. i spektr. 9 no.2:273-275 Ag '60.

(Hafnium halides)

(MIRA 13:8)

GODNEV, I.N.; ALEKSANDROVSKAYA, A.M.

Use of the curves  $\epsilon = f(Z_X)$  for the study of the vibrational  
spectra of tetrahedral molecules and ions of the form  $X(\text{Hal})_4$ .  
Opt. i spektr. 10 no. 1:27-32 Ja '61. (MIRA 14:1)  
(Halides--Spectra) (Ions--Spectra)

GODNEV, I.N.; SVERDLIN, A.S.

Equilibrium of dichlorobenzene isomers. Zhur. fiz. khim. 35  
no.2:474-475 P '61. (MIRA 16:7)

1. Ivanoskiy khimiko-tehnologicheskii institut.  
(Benzene) (Phase rule and equilibrium)

ALEKSANDROVSKAYA, A.M.; ALESHONKOVA, Yu.A.; SINITSYNA, L.N.; GODNEV, I.N.

Thermodynamic functions of silicon tetraiodide and zirconium tetraiodide in the gaseous state. *Izv.vys.ucheb.zav.; khim.i khim.tekh.* 5 no.1:171-172 '62. (MIRA 15:4)

1. Ivanovskiy khimiko-tekhnologicheskii institut, kafedra fiziki.  
(Silicon iodide) (Zirconium iodide)

S/076/62/036/012/001/014  
B101/B180

AUTHORS: Godnev, I. N., Aleksandrovskaya, A. M., and Sverdlin, A. S.  
(Ivanovo)

TITLE: Correspondence between the force constants of  $XY_4$  and  $XY$  molecules, where X is a IVB subgroup element and Y a halogen

PERIODICAL: Zhurnal fizicheskoy khimii, v. 36, no. 12, 1962, 2609 - 2615

TEXT: The coefficients  $k_q$  of  $XY_4$  molecules are compared with the force constants  $k_q$  of  $XY$  molecules for halogen (Y) compounds of elements (X) of the IVB subgroup. Approximate equations are derived for calculating the dynamic coefficients of  $XY_4$  molecules by M. Larnaudie's method (J. Phys. et radium, 15, 365, 1954):  $k_1 = k_q + 3h = \nu_1^2/\epsilon_y$ ,  $k_2 = k_q - 21 - 0 = \nu_2^2/\epsilon_o^2$ ,  $k_{11} = k_q - h \approx \nu_3^2/\Lambda_{11} + \Lambda_{12}^2\nu_4^2/\Lambda_{11}\Lambda$ ,  $k_{12} = \sqrt{2}(a-b) \approx -\Lambda_{12}\nu_4^2/\Lambda$ ,  $k_{22} = k_q - 0 \approx \Lambda_{11}\nu_4^2/\Lambda$  (1), where  $k_1$  and  $k_2$  are the reduced dynamic coefficients of the one-dimensional blocks,  $k_{11}$ ,  $k_{12}$ , and  $k_{22}$  are the Card 1/3

Correspondence between ...

S/076/62/036/012/001/012  
B101/B180

reduced coefficients of the two-dimensional block  $A_{11}$ ,  $A_{12}$ , and  $A_{22}$  are the kinematic coefficients of the two-dimensional block. For the other symbols see M. V. Vol'kenshteyn, M. A. Yel'yashevich, B. I. Stepanov, Kolebaniya molekul (Vibrations of molecules); v. I., Gostekhteorizdat, M., 1949. System (1) produced values for the force constants of  $CCl_4$ ,  $CBr_4$ ,  $SiF_4$ ,  $GeCl_4$ ,  $GeBr_4$ , and  $CF_4$  which were consistent with published figures. The relation  $k_q \approx k_e + 0.4$  was obtained for chlorides, bromides, and iodides by comparing the  $k_q$  coefficients of halogen compounds of C, Si, Ge, Sn, and Pb with the  $k_q$  coefficients of diatomic molecules obtained by Y. P. Varshni (J. Chem. Phys., 28, 1081, 1958). Comparison of  $r_e$  the interatomic distances for diatomic molecules with  $r_q$  for  $XY_4$  molecules yields  $r_e > r_q$  for iodides and  $r_e < r_q$  for fluorides up to  $GeF_4$ . The course of  $r_e$  and  $r_q$  as a function of  $Z_y$  at constant  $X$  (Fig. 3) can be used for determining  $r_q$  of  $PbF_4$ ,  $PbBr_4$ , and  $SnF_4$ . There are 1 figure and 3 tables. The most important English-language references are: Y. Morino, Y. Nakamura a. T. Card 2/3



Correspondence between ...

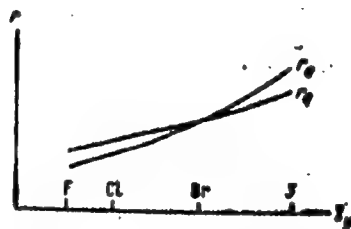
S/076/62/036/012/001/014  
B101/B180

Jijima, J. Chem. Phys., 32, 643, 1960; C. W. F. T. Pistorius, J. Chem. Phys., 28, 514, 1958.

ASSOCIATION: Ivanovskiy khimiko-tekhnologicheskii institut (Ivanovo Institute of Chemical Technology)

SUBMITTED: March 4, 1961

Fig. 3.  $r_e$  and  $r_q$  as functions of  $Z_y$ .



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RIGINA, I.V.; GODNEV, I.N.

Law of the exclusion of redundant coordinates in the problem of  
molecular vibration involving generalized forces. Izv. vys. ucheb.  
zav.; fiz. no.4:171-175 '63. (MIRA 16:9)

1. Sibirskiy tekhnologicheskii institut i Ivanovskiy khimiko-  
tekhnologicheskii institut.  
(Molecules—Vibration) (Matrices)

L 11059-63

EWI(q)/EWI(m)/BDS--AFPTC/ASD--JD

ACCESSION NR: AP3000480

S/0153/63/006/001/1165/0166

AUTHOR: Aleksandrovskaya, A. M.; Godnev, I. N.; Sverdlin, A. S. 35

TITLE: Thermodynamic functions of hafnium halides

SOURCE: Izv. VUZ: Khimiya i khim. tekhnologiya, v. 6, no. 1, 1963, 165-166

TOPIC TAGS: thermodynamic functions, enthalpy function, free energy function, entropy, specific heat, Hf chloride, Hf bromide, Hf iodide

ABSTRACT: As a supplement to their previous tabulation of the thermodynamic functions of iodides of fourth group elements, authors present a tabulation of the thermodynamic functions of hafnium iodide, hafnium chloride, and hafnium bromide. These were calculated from vibrational frequencies found by the method of A. M. Aleksandrovskaya and I. N. Godnev (Optika i spektroskopiya, 9, 273, 1960), using the interatomic separations found in the same article. Experimental (calorimetric) and calculated entropy values for Hf chloride at 485 and 496K agree to within 0.5%. Orig. art. has: 3 tables.

ASSOCIATION: Kafedra fiziki, Ivanovskiy khimiko-tekhnologicheskii institut (Department of Physics, Ivanovskiy Chemical Technological Institute)

Card 1/1

ALEKSANDROVSKAYA, A.M.; GODNEV, I.N.

Normal vibration frequencies of  $\text{ZnCl}_4^{2-}$ ,  $\text{CdCl}_4^{2-}$ ,  $\text{HgBr}_4^{2-}$ ,  $\text{HgI}_4^{2-}$   
ions. Zhur. fiz. khim. 37 no.5:1113-1115 My '63. (MIRA 17:1)

1. Ivanovskiy khimiko-tekhnologicheskii institut.

SAVOGINA, M.S.; GODNEV, I.N.

Heat capacity of  $C_{12}$  liquid nitrophenols. Zhur.fiz.khim. 37 no.7:1633-1634  
Jl '63. (MIRA 17:2)

1. Ivanovskiy khimiko-tekhnologicheskii institut.

GODNEV, I.N.; BIRGER, B.N.

Increase in entropy dis in the irreversible course of chemical reactions. Zhur. fiz. khim. 37 no.11:2553-2554 N'63.  
(MIRA 17:2)

1. Ivanovskiy khimiko-tekhnologicheskij Institut.

L 39412-65 (EWT(1) IJP(c)

ACCESSION NR: AP5006054

8/0139/65/0001/001/0057/0061

AUTHOR: Vinogradova, V. N.; Godnev, I. N.

TITLE: On the applicability of the method of "progressing rigidity" to molecules  $X(Hal)_4$  in light of the theory of characteristic frequencies

SOURCE: IVUZ. Fizika, no. 1, 1965, 57-61

TOPIC TAGS: tetrahedral molecule, halide, characteristic frequency, group IV element

ABSTRACT: The method of "progressing rigidity" was first proposed by M. Larnaudie (J. phys. et radium, v. 15, 365, 1964). The present article is devoted to an analysis of the existence of characteristic oscillations that explain the good applicability of the method of "progressing rigidity" to molecules of the type  $X(Hal)_4$ , where X is an element of group IV. The analysis is carried out in light of the theory of characteristic frequencies advanced by L. S. Mayants (Teoriya i raschet kolebaniy molekul [Theory and Calculation of Vibrations of Molecules] M., 1961). Application of this theory to the molecules  $CS_4$ ,  $CBr_4$ ,  $CCl_4$ , and  $GeCl_4$ , using the

Card 1/2

L 39412-65

ACCESSION NR: AP5006054

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force constants published in the literature, shows that the method of the "progressive rigidity" can be applied with good approximation to the molecules  $X(Hal)_4$ . It is shown that the good applicability of the method is connected with the existence of three approximate characteristics (a term introduced by L. S. Mayants in his work), which involve the singularities of the wave form and frequency of various oscillations of the molecules. Orig. art. has: 22 formulas and 1 table.

ASSOCIATION: Ivanovskiy khimiko-tekhnologicheskii institut (Ivanovo Chemical-Technological Institute)

SUBMITTED: 15Jul63

ENCL: 00

SUB CODE: GP, CC

NR REF SOV: 010

OTHER: 005

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Card 2/2



L 13004-66 EWT(d)/EWT(1) IJP(c)  
ACC NR: AP6001637

SOURCE CODE: UR/0051/65/019/006/0074/0880

AUTHOR: Godnev, I. N.; Zaytsev, A. A.; Rigina, I. V.

ORG: none

TITLE: Using Lagrange's equations with non-excluded bonds for constructing a theory of molecular vibrations in dependent coordinates

29  
B

SOURCE: Optika i spektroskopiya, v. 19, no. 6, 1965, 874-880

TOPIC TAGS: Lagrange equation, molecular physics, *vibration*

ABSTRACT: The authors propose a method for using Lagrange's equations with non-excluded bonds for taking account of any number of linear relationships between coordinates in the problem of vibrations in a molecule. This method eliminates the ambiguities which arise from unconditional application of ordinary Lagrange equations in the case of dependent coordinates. Expressions which describe the molecular oscillations are derived and the physical meanings and properties of the parameters which appear in these equations are analyzed. A comparison is made between differential equations for the vibration containing no more than two matrices in dependent

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UDC: 535.338.42.001.1

L 13004-66

ACC NR: AP6001637

and independent coordinates. The results show that a step by step application of Lagrange equations with non-excluded bonds is useful for constructing a logically systematic theory of vibrations in dependent coordinates. Orig. art. has: 1 table, 53 formulas.

SUB CODE: 20/ SUBM DATE: 16Nov64/ ORIG REF: 009/ OTH REF: 002

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Card 2/2

L 36180-66 EWT(m)/EWP(t)/ETI IJP(c) ES/JD/WH/JW/JG

ACC NR: AP6014261

SOURCE CODE: UR/0153/66/C09/001/CO+0/CO43

AUTHOR: Godnev, I. N.; Sverdlin, A. S.

ORG: Physics Department, Ivanovo Chemical Engineering Institute (Kafedra fiziki,  
Ivanovskiy khimiko-tekhnologicheskii institut)

TITLE: Heats of formation of gaseous uranium fluorides

SOURCE: IVUZ. Khimiya i khimicheskaya tekhnologiya, v. 9, no. 1, 1966, 40-43

TOPIC TAGS: heat of formation, uranium compound, fluoride, heat of sublimation

ABSTRACT: The heats of formation of gaseous  $UF_5$ ,  $UF_4$ ,  $UF_3$ ,  $UF_2$ , and  $UF$  were calculated. In the case of  $UF_4$ , the calculation involved the use of the heat of formation of the crystalline substance and of its heat of sublimation, and the value obtained was  $\Delta H_{298}^0 = -366$  kcal/mole. In the case of the remaining four fluorides, two methods were employed. In the first method, a curve of the heats of formation of gaseous fluorides  $UF_n$  from F (gas) and U (gas) were plotted as functions of n, and the results were recalculated for the standard state. The second method involved plotting the curve of the heats of detachment of a fluorine atom from  $UF_n$  (i. e., the curve of the heats of reaction at 298°K), according to the reaction

$$UF_n(\text{gas}) \rightarrow UF_{n-1}(\text{gas}) + F(\text{gas}) + \Delta H_n^0$$

as functions of n. The average heats of formation  $\Delta H_{298}^0$  obtained by these two meth-

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UDC: 541.11+536.66

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ACC NR: AP6014261

ods are -440, -257, -141, and -20 kcal/mole for gaseous  $UF_5$ ,  $UF_3$ ,  $UF_2$ , and  $UF$  respectively. Orig. art. has: 3 figures and 4 tables.

SUB CODE: 07/ SUBM DATE: 12Jun64/ ORIG REF: 004/ OTM REF: 005

Card 2/2/mlp

GODNEV, T.N.; AKULOVICH, N.K.; ROTFARB, R.M. (Minsk)

Complete synthesis of chlorophyll and its biosynthesis. Usp.  
sovr. biol. 55 no.2:204-218 '63. (MIRA 17:8)

GODNEV, T.N., akademik; ROTFARB, R.M.

Relationship of the biosynthesis of phytol and carotenoids.  
Dokl. AN SSSR 153 no.3:718-720 N '63. (MIRA 17:1)

1. Institut biologii AN BSSR. 2. AN BSSR (for Godnev).



L 25782-65 EMO(j)/EMO(r)/EMT(1)/FS(v)-3/EMO(v)/EMO(a)/EMO(c) Pa-5 DI

ACCESSION NR: AR5000950

S/0299/64/000/020/G002/G002

SOURCE: Ref. zh. Biologiya. Sv. t., Abs. 2067

AUTHOR: Godnev, T. N.; Shabel'skaya, E. P.

TITLE: On the problem of chlorophyll and carotenoid daily fluctuations in leaves of certain plants

CITED SOURCE: Fiziol. rasteniy, v. 11, no. 3, 1964, 385-390

TOPIC TAGS: plant, chlorophyll, diurnal variation, spectrophotometer, plant pigment

TRANSLATION: The biological and physiological literature contain highly contradictory data on the presence of significant daily fluctuations in chlorophyll content of various plants. Chlorophyll level changes were investigated per square area unit at 0006, 0012, and 0018 hrs in the tomato, potato, Nymphaea lutea pond lily, Syringa emodi lilac, and abutilon (Abutilon striatum). Within the accuracy limits obtainable by a spectrophotometric method with a SF-4 spectrophotometer, no chlorophyll level fluctuations were found

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ACCESSION NR: AR5000950

in the investigated plants, though in the abutilon the chlorophyll level increased slightly during afternoon hours. The authors indicate that further research on a large number of plants of different ecological groups is necessary to provide a conclusive answer to the problem. Institute of Experimental Botany and Microbiology AN BSSR, Minak.

SUB CODE: LS

ENCL: 00

Card 2/2



*BC*

*a-3*

Determination of chlorophyll with the aid of  
the light of a Lange electrical spectrometer. T. N.  
GODNEY and R. V. KALISHENKOV (Compt. rend.  
Acad. Sci. U.R.S.S., 1968, 2, 77--79).—Chloro-  
phyll in solutions containing 0.20 mg. per litre can  
be determined by Lange's colorimeter: +20 o.c.  
of solution are needed. Using a Schott red filter  
CO<sub>2</sub>, extracts can be used directly. P. G. C.

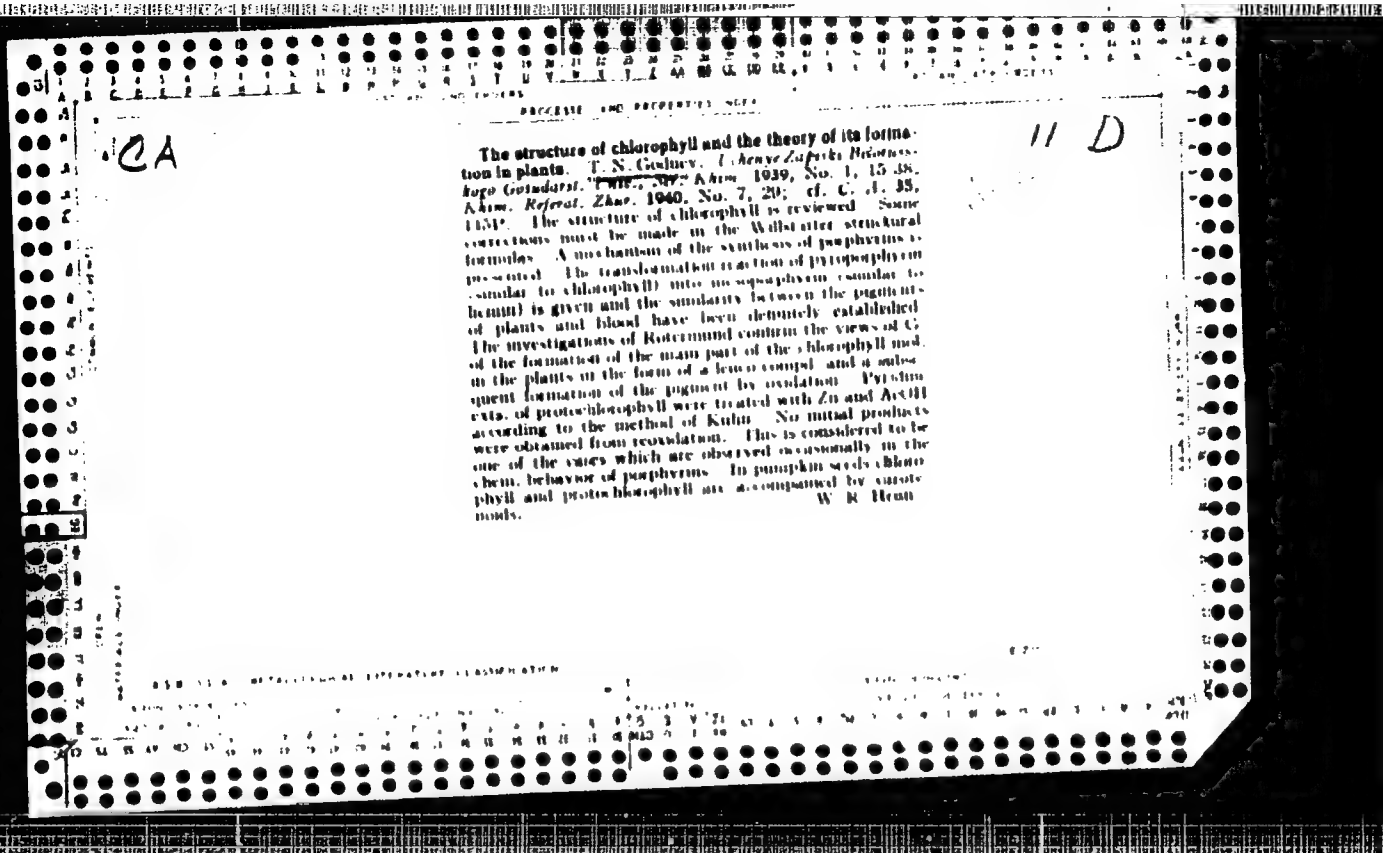
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S. Kalishenich

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

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The reaction of magnesiopyrrole with complex esters of some dibasic acids. T. N. Golubev. *Uchenye Zapiski Belorusskogo Gosudarst. Univ., Ser. Khim.* 1959, No. 1, 3-13; *Khim. Referat. Zhur.* 1960, No. 2, 26. The reactions between magnesiopyrrole with complex esters of substituted unsatd. and aromatic acids were investigated. From the action of the di-Et esters of succinic, male and fumaric acids there were obtained products of unknown compns. The brown color of these products changed by the action of acids to olive-green. The color was restored to the original brown by the action of alkalis. Action of the di-Me and di-Bu esters of tartaric acid produced a dark tarry substance which formed a blue-violet product sol. in ether (owing to the decoupn. with water contg.  $\text{NH}_4\text{Cl}$ ). The compn. of this product is  $\text{C}_{11}\text{H}_{10}\text{O}_4\text{N}_2$ . From its similarity with the substances described previously G. supposes it to be 1,4-dipyrrolyl-1,4-dipyrrolyl-2,3-butanediol. Pyrrolylphthalide was obtained from the action with  $\alpha\text{-C}_6\text{H}_4(\text{CO}_2\text{Et})_2$ . In this case the reaction takes place only with one  $\text{CO}_2\text{H}$  group and the ketone obtained is, probably, isomerized into the enolic form. This is followed by the splitting off of 1 mol. of alc. (formed from the  $\text{EtO}$  group of the  $\text{CO}_2\text{Et}$  and the H atom of the enolic HO). This corresponds to the supposed mechanism of the incomplete reaction between magnesiopyrrole and the complex esters with the formation of ketones.

W. R. Henn



Chlorophyll concentration in chloroplasts of *Maianthemum*. T. N. Gudnev and S. V. Kalishevich. *Compt. rend. acad. sci. U. R. S. S.* 27, 812-3 (1940) (in English).—

In order to det. the approximate amt. of chlorophyll in a unit of vol. and a unit surface in the leaves of *M. ann.*, 22 leaves of the plant were drawn on paper with 32-fold magnification, and their area was estd. according to Pfeffer by weighing the paper patterns. Four of these leaves were photographed and studied for their number of cells, number of plastids in a cell and the size of the plastids. To det. chlorophyll the 22 leaves were ground into a thin mass with quartz sand and chalk, estd. with 30 cc. of acetone, the soln. made up to 30 cc. and the extinction measured 4 times by means of Lange's colorimeter. The av. no. of chloroplasts in a leaf is 775,178. The total amt. of chlorophyll is 42 g or 1,900 g per leaf. The av. amt. of chlorophyll in a chloroplast is  $2.4 \times 10^{-9}$  g. references.

A. H. Knappe

A. H. Krapp

ASB-514 METALLURGICAL LITERATURE CLASSIFICATION

**Leucophyll and protochlorophyll.** T. N. Lankov and S. V. Kalashnikova. *Trudy Inst. Plant. Nauk* (no. K. A. Timiryazev 4, No. 3, 195-6 (1948)).—A review with many references on the natural formation of chlorophyll is presented. A theory of formation is formulated thus: the 1st step is formation of pyruvic compds. having a H in the  $\alpha$  position, which then condense with  $\text{CH}_2\text{O}$  to yield leucophyll, which by oxidation gives tetrahydropyrrolophyrinogen, which by a loss of  $\text{H}_2\text{O}$  may give tetrapyrrolophosphoryl which is reduced, in several steps, to protochlorophyll or chlorophyll. Although it was not possible to isolate leucophyll from the expl. plant sprouts, the reduction of protochlorophyll to the leuco deriv. was demonstrated; the latter oxidizes to a substance whose spectrum is comparable to that of protochlorophyll. The inner skins of the pumpkin seeds were rapidly extd. with pyridine and the ext. alcohol was dild. with EtOH. This was treated with eq.  $\text{AcOH}$  and Zn dust in N atm. for 2 hrs. at room temp. The pale yellow soln. could be kept without change under petroleum for 2 months. Bubbling with  $\text{O}$  reoxidizes the material in 1 hr. at  $80^\circ$ , in 2 hrs. at  $50^\circ$ , while standing in the air at  $15^\circ$  required 32 hrs. for reoxidation. The oxidized soln. on passage through sucrose moistened with benzene gave 3 absorption zones: a narrow dark one (where concn. of a compound with abs. bands at 6282-6175, 6019-5906, 5687-5549, 5583-5470, and 5349-5191 Å. took place), a middle green zone (where concn. of component with abs. bands at 6325-6197, 6057-5839, 5635-5502, 5589-5511 and 5411-5253 Å. took place) and a yellow carotenoid zone. G. M. K.

G. M. K.

ASAC.11A METALLURGICAL LITERATURE CLASSIFICATION

GODN'V, T. N.

The structure of chlorophyll and possible ways of its development in a plant; report.  
Moskva, Izd-vo Akad. nauk SSSR, 1947. 48, 2 p. (Timiriazevskie chteniia, 7)

GODNEV, T. N.

USSR/Medicine - Chlorophyll

Jul 47

Medicine - Amino Acids - Determination

"The Nature of the Bond Between Chlorophyll and Protein in Chloroplasts," T. N. Godnev,  
Lab Plant Physiol, Acad Sci USSR; O. P. Osipova, Inst Plant Physiol imeni K. A.  
Timiryazev, Acad Sci USSR, 4 pp

"Dokl Akad Nauk SSSR, Nova Ser" Vol LVII, No 2

Lists experiments of various scientists to determine nature and character of subject  
bond. Describes experiments showing effect of amino acids, palmitinic acids, and ethyl  
bromides on chlorophyll. Submitted 22 Jan 1947.

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CA

11-2

Effect of cations and anions on the rate of extraction of chlorophyll from living leaf tissues. T. N. Golubev, V. M. Terent'ev, and K. P. Parnon. *Izv. Akad. Nauk Kazan. S.S.R.* 1968, No. 3, 75 D. - Rate of chlorophyll from peralgonia or carrot leaves is accelerated by the presence of ions of Na, Ba, Ca and Mg in the 60% EtOH used for extra. The acceleration increases with increased concn. of the ions (used as nitrates except for  $\text{CaCl}_2$ ) and max. effect occurs at 2N concn. The order of activity increases Na, Ca, K, Ba, Sr, Mg. Possibly the ions favor the cleavage of chlorophyll from its linking with protein and lipides.  
G. M. Kuvshinov



CA

1

15-A

Growth control substances and the possibilities of their  
use in the control of weeds T. N. Gindrey and V. M.  
Terent'ev. *Izv. Akad. Nauk SSSR Ser. Khim.* 1968,  
No. 4, 99-101. A brief review. Weeds of agricultural  
types are controlled readily by 4-6 kg per ha of 2,4-D, al-  
though its effects are shown even by 2-4 kg. At  
these levels the material causes a delay of up to 9 days in  
sprouting of wheat. G. M. Kozlovskiy

GODNEV, T. N.

Godnev, T. N. "K. A. Timiryazev and modern theories of the formation of chlorophyll in plants ", Uchen. zapiski (Belorus. gos. un-t), Issue 7, 1948, p. 3-18,-  
Bibliog: 10 items.

SO: U-3261, 10 April 53, (Letopis 'Zhurnal 'nykh Statey, No. 11, 1949).

GODNEV, T. N.

GODNEV, T. N. "The role of Russian scholars in the development of studies of chlorophyll", In the collection". Materialy noyabr'skoy sessii Akad, nauk BSSR, 1947, Minsk, 1949, p. 140-49.

SO: U-4393, 19 August 53 (Letopis 'Zhurnal 'nykh Statey', No. 22, 1949).

Gershberg, V. I., V. M. ..., "The ...  
diffusion of chloroacetyl on the products of the ...  
dissociation of ... molecular weight", Investive Akad. Nauk, 1973,  
No. 1, p. 34, - 35; ...

So: 0-2241, 1 April 73, (Russian 'Zhurnal' ... 12, ...).

GODNEV, T. N.

22390. Godnev, T. N. OBRAZOVANIYE KHLOROFILIA I KHLOROTICHESKIEH LIST'YAKH PRI INFIL'TRATSII SOLEY ZHELEZA. IZVESTIYA AKAD. NAUK BSSR, 1949, No. 3, S. 153-56

SO: LETOPIS' No. 30, 1949

104

112

2-16-61 3332

Structure of chloroplasts and concentration of chlorophyll in some aquatic plants. F. N. Goshuev, S. V. Kishchevich, and G. F. Lukharkov. 1970/1971. Izv. Akad. N.S.S.R. 06, 107-110 (1970). Average chlorophyll content in chloroplasts during growth period is  $2 \times 10^{-3}$  in *Syringa vulgaris*,  $2.4 \times 10^{-3}$  in *Malva moschata*,  $1.8 \times 10^{-3}$  in *Elodea canadensis*; the amt. varies from  $1.0 \times 10^{-3}$  to  $4.3 \times 10^{-3}$  approx. with the size of the chloroplasts. In *Potamogeton latens* the chlorophyll content per chloroplast is similar in surface specimens and somewhat lower in specimens taken from 3 m. depth, with a similar result being found in *P. perfoliatus*. The semiaxes of the chloroplasts from the *P. perfoliatus* (in  $\mu$ ) are 3.65, 3.04, and 1.60; from *P. latens*: 3.16, 2.4, and 1.34 (surface specimens, with somewhat larger values for the deeper water specimens). G. M. Kozlovskii

ALSO SEE DETAILLED LITERATURE CLASSIFICATION

GODNEV-T. N.

Med ✓ Comparative energy of extraction of chlorophyll of various plants by inactive solvents. T. N. Godnev, M. V. Terent'eva, and K. P. Parihon. ~~Ann. Inst. Biol. S.S.R.~~ *Ann. Inst. Biol. S.S.R.*, *Sbornik Nauch. Trudov* 1950, No. 1, 3-7. — Petr. ether exts. only 5-10% of chlorophyll from crushed leaves of plants like sunflower, corn, spinach or quackgrass, whereas leaves of plants like grapes, oak, cherry, or horsetail yield 20-38% of their chlorophyll under the same conditions. The greatest content of chlorophyll is extractable from plants at the very end of the vegetation period, at which time the values of extractability are some 30% over the min. The results indicate the presence of chlorophyll in the plastids not only bound with proteins but also in a lipid sol. form, and possibly colloidal form, as indicated by spectrometric detns. of Krasnovskii and Brin (C.A. 40, 69405). Alteration of extractability of chlorophyll with petr. ether with the season is explained by alteration in equil. between the chlorophyll-protein-lipide complex on one hand and free chlorophyll, protein, and lipid matter, on the other hand. The binding in such complexes is believed to take place between the N-atoms of the pyrrole rings and the carboxyl groups of the protein. G. M. Kosolapoff

GODNEV, T.N., professor; TEREKHT'YEV, V.M., kandidat biologicheskikh nauk.

Study of the effect of potassium and phosphate nutrition on the formation of structural tissues and on stalk firmness of cereals in connection with lodging. Sbor.nauch.trud.Inst.biol.AN BSSR no.1: 25-34 '50. (MLNA 9:1)

1.Deyatvitel'nyy chlen AN BSSR (for Godnev).  
(Grain) (Plants--Nutrition)



GODNEV, T.M.; MIROMENKO, A.V., kandidat biologicheskikh nauk.

Lupine as a forage plant. Sbor.nauch.trud.Inst.biol.AN BSSR  
no.1:67-75 '50. (MLRA 9:1)

1.Deystvitel'nyy chlen AN BSSR (for Godnev)  
(Lupine)

GODNEV, T.N., profesor; TERENT'YEV, V.M., kandidat biologicheskikh nauk.

Study of the effect of potassium and phosphate nutrition on the formation of structural tissues and on stalk firmness of cereals in connection with lodging. Sbor.nauch.trud.Inst.biol.AN BSSR no.1:97-99 '50. (MIRA 9:1)

1.Deystvitel'nyy chlen AN BSSR (for Godnev).  
(Carrots) (Carotene)

1000 V, A. M.

"Concerning the Chlorophyll in a Bacteriod Orgainism of Sewage", Iz Ak Nauk Belorus SSR, No. 6, p 167, 1950.

11-10

CA

**Quantitative determination of chlorophyll and some carotenoids.** T. N. Goshov and V. M. Terent'ev (Akad. Nauk. Belorussk. SSR, Minsk). *Trudy Inst. Fiziol. Rastenii im. K. A. Timiryazeva* 7, No. 1, 230-24 (1950).  
To det. chlorophyll, triturate the specimen with quartz sand, chalk, or  $MgCO_3$  and ext. with 90% EtOH or 85%  $Me_2CO$ . If specimen is dry, or also, EtOH or  $Me_2CO$  for a fresh specimen. Ext. under suction in a filtering funnel. Subject the ext. to volumetry. For a simplified detn. use a stand and soln. of 50 ml. of 4%  $K_2CrO_4$ , 20.5 ml. of 1%  $CaCl_2$ , and 10 ml. of 10%  $NH_4OH$ . To det. carotene, ext. as above, add the ext. (or an aliquot) to 20 ml. of petr. ether, sep. the aq.- $MgCO_3$  layer (colorless), wash the org. layer several times with H<sub>2</sub>O, pass it through a chromatographic tube with

$MgO$ , wash with a little petr. ether, and use the resulting yellow soln. for colorimetric detn. Acetone in 10 ml. can be used as the standard, 11.55 mg. per 100 ml. EtOH corresponding in color to 2.25 mg. of carotene in 1 l. of petr. ether. Det. the amt. of carotenoids in the acetone ext. photometrically with suitable light filters after detg. chlorophyll with a red filter. To combine the detn. of chlorophyll a and b and carotenoids chromatograph on sugar in petr. ether; chlorophyll b forms the upper band, chlorophyll a forms a band below it, xanthophyll forms a still lower band, while carotenoids are not retained. G. M. Koudasoff

17610

USSR/Biology - Plants, Nutrition

1 Aug 50

"Feeding of Fruit Trees by Spraying With a Diluted Balanced Nutrient Solution," T. N. Godnev, Act Mem Acad Sci Belorussian SSR, N. S. Sudnik, E. P. Syubova

"Dok Ak Nauk SSSR" Vol LXIII, No 4, pp 835, 836

Discusses favorable results of spraying 3-mo old hybrid seedlings of the prune, *Prunus domestica* L., and of the pear, *Pyrus communis* L., with balanced nutrient solution made by adding to 6 liters of water following amounts of salts in grams:  $\text{Ca}(\text{NO}_3)_2 \cdot 12\text{H}_2\text{O}$  60,  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$  60,  $\text{H}_3\text{BO}_3$  3.66,  $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$  2.33,  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  0.33,  $\text{ZnSO}_4$  0.33,  $\text{Al}_2(\text{SO}_4)_3$  0.33, 176r8

USSR/Biology - Plants, Nutrition 1 Aug 50  
(Contd)

$\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$  0.33,  $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$  0.33,  $\text{KI}$  0.17,  $\text{KBr}$  0.17, and  $\text{Sn}(\text{NO}_3)_2$  0.17 and then dilg before use by putting 10 cc in 10 liters of water. Two tables of test data.

GODNEV, T. N.

176r8

114

Chlorophyll content of fresh-water plankton. T. N. Godnev, S. V. Kalishevich, and G. P. Zakharich (Belorus, Gosudarst. Univ., im. V. I. Lenina). *Doklady Akad. Nauk S.S.S.R.* 78, 1041-4 (1950).—Some 31 specimens drawn from lakes in Western Russia were analyzed for chlorophyll. Variations from 2.4 to 184  $\gamma/l$ . were found. The highest values were found in plankton from Naroch Lake in summer months, a lake with high clarity of water and poor level of plankton population. Generally, deep oligotrophic lakes gave low values while shallow lakes tended to give higher values. Generally the level of photosynthesis paralleled the plankton population. G. M. Kosolapoff

GODNEV, T.N., professor; TERENT'YEV, V.M., kandidat biologicheskikh nauk.

Effect of light on the pigmentation and seedling growth of certain  
woody plants. Sbor.nauch.trud.Inst.biol.AN BSSR no.2:121-130 '51.  
(MLRA 9:1)

1.Deystvitel'nyy chlen AN BSSR.

(Plants, Effect of light on)

GODNEV, T.N., professor; THERENT'YEVA, M.V.

Dynamics of chlorophyll accumulation in certain hothouse plants  
during the course of a year when grown in the White Russian  
S.S.R. Sbor.nauch.trud.Inst.biol.AN BSSR no.2:172-174 '51.  
(MLRA 9:1)

1.Deystvitel'nyy chlen AN BSSR.(for Godnev)

(Chlorophyl) (White Russia--Greenhouse plants)



GODNEV, T.N., professor; MIROMENKO, A.V., kandidat biologicheskikh nauk;

Effect of substitution products of phenoxyacetic acid on kok-saghyz  
root growth and rubber accumulation. Sbor.nauch.trud.biol.AN BSSR  
no.2:214-220 '51. (MLBA 9:1)

1, Deystvitel'nyy chlen AN BSSR (for Godnev).  
(Kok-saghyz) (Growth promoting substances) (Acetic acid)

GODNEV, T.N.

[The structure of chlorophyll and methods for its quantitative analysis] Stroenie khlorofilla i metody ego kolichestvennogo opredeleniia. Minsk, Izd-vo AN BSSR, 1952. 162 p. (MLRA 10:4)  
(Chlorophyll)

GODNEV, T.N.; TERENT'YEVA, M.V., nauchnyy sotrudnik.

Effect of light on grain yield and resistance to lodging in oats.  
Sbor.nauch.trud.Inst. biol.AN BSSR no.3:3-17 '52. (MLRA 9:2)

1.Daystvitel'nyy chlen AN BSSR (for Godnev)  
(Oats) (Plants, Effect of light on)

# USSR .

✓ Enzymic transformation of protochlorophyll into chlorophyll in etiolated leaves of corn kept in darkness. T. M. Godnev and M. V. Terent'eva. *Vyski Aka. Nauk SSSR*, 1952, No. 6, 37-41. — Kernels of corn were germinated in the dark at 20-23° and their first leaves (in the amt. of 5-20 g.) were then etiolated and transferred into 800-850 ml. of a juice obtained on pressing (under 5000 atm.) germinated fir seeds; to the juice were previously added 0.5-2.5 ml. of 0.5 N ascorbic acid and 15 ml. of a yeast ext. (50 g. yeast extd. with 100 ml. H<sub>2</sub>O at 80°). The extd. dish was put into a desiccator, from which air was driven off for 20 min. After 48 hrs. the leaves were put into hot water for 2 min., washed thoroughly, dried, and powdered. From the dry prepn. the leaf pigments were then extd. with acetone and the exts. studied spectroscopically for the presence of chlorophyll; all operations were performed in the absence of light. In this way it was shown that the etiolated leaves of corn synthesized (without participation of light) 0.003 mg. chlorophyll a and 0.002 mg. chlorophyll b per g. dry leaves. E. Wietbicki.

CA

Content of chlorophyll in buds of woody plants in winter and spring T. N. Godovoy and M. V. Terent'eva (Bot. Inst. Minsh). *Doklady Akad. Nauk S.S.S.R.* 23, 481-4 (1952); cf. *Trudy Inst. Forest. Razvitiya K. A. Timiryazev. Akad. Nauk S.S.S.R.* 7, 204 (1950). Examin. of specimens of *Fagus*, *Populus*, *Alnus*, *Quercus*, *Syringa*, *Betula*, *Acer*, *Ulmus*, and *Abies* species revealed that the chlorophyll in hibernating buds contains 0.0372-0.248 g. of chlorophyll a and 0.0117-0.000 g. of chlorophyll b/kg. Carotene varies from 0.003 to 0.000, and xanthophyll from 0.000 to 0.000. The swelled almost opening buds in the spring contain 0.2-0.7 g. of chlorophyll a, 0.005-0.165 g. of chlorophyll b, 0.020-0.005 g. of carotene, and 0.045-0.126 g. of xanthophyll/kg. If chlorophyll b forms from chlorophyll a, this change probably occurs immediately after formation in the plastid of the initial mobs. of chlorophyll and continues with approx. constant ratio of the 2 components. (I. M. Koudapoff)



USSR

The amount of alkaloids in different varieties of lupine grown in Byelorussian S.S.R. T. N. Golubev and A. V. Mironenko. *Izvit. Akad. Nauk Byelorussk. SSR*, 1953, No. 4, 63-71; *Referat. Zhur. Khim.*, 1954, No. 16351. The amt. of alkaloids (I) was studied in different varieties of lupine. Pulverized seeds and other parts of the plant were extd. with a soln. consisting of Et<sub>2</sub>O, CCl<sub>4</sub>, and 10% NaOH soln. in the ratio of 10:6:1, resp. The amt. of I was equal to the difference between the dry substance of the ext. before and after calcification. The seeds of the so-called lupine varieties contained I from 0.01 to 0.4% while those of the bitter varieties from 1.202 to 3.300% of the abs. dry substance, resp. The biosynthesis of I is more intense during dry and hot vegetative period. The amt. of I is higher in leaves than in stalks, and approx. 2 times as much I is present in physiologically younger (upper) leaves than in older (lower) ones. It is concluded that I are not the final products of the metabolism, but its active participants. H. W.

1. Grain, 1953; Grain, 1953.
2. Grain (60)
4. Grain
7. The fight against lodging of cereal crops on peat soils, L.N. Rodnev, V.M. Terent'ev, Priroda 42 no. 5, 1953.

9. Monthly List of Russian Accessions, Library of Congress, APRIL 1953, Unclassified.



GODNEV, T.N.; TEREENT'EVA, M.V.

Transformation of protochlorophyll into chlorophyll in etiolated  
leaves of corn after infiltration of extracts of sprouts of fir.  
Doklady Akad. Nauk S.S.S.R. 88, 725-7 '53. (MLRA 6:2)  
(CA 47 no.15:7602 '53)

GODNEY, T. N.

Chem Abs

U.48 25 Jan 54

Botany

Glucose as the raw material for synthesis of assimilating pigments of plants. T. N. Godney and A. A. Shlyk. *Doklady Akad. Nauk S.S.S.R.* 91, 809-810 (1953).—A review on possible mechanisms of formation of plant pigments like chlorophyll is given with 7 references. It was shown that monoses are the raw materials for formation of pigments like chlorophyll and carotenoids. Etiolated leaves of the onion were treated with C<sup>14</sup>-labeled glucose and the leaves were illuminated until green color formed. The chlorophyll and carotenoid content of such leaves contained considerable concn. of radioactive C. The labeled glucose was prepd. photosynthetically in tobacco leaves.

G. M. Kondapoff

(2)

The Committee on Stalin Prizes (of the Council of Ministers USSR) in the fields of science and inventions announces that the following scientific works, popular scientific books, and textbooks have been submitted for competition for Stalin Prizes for the years 1952 and 1953. (Sovetskaya Kultura, Moscow, No. 22-40, 20 Feb - 3 Apr 1954)

<u>Name</u>	<u>Title of Work</u>	<u>Nominated by</u>
Godnev, T. T.	"The Structure of Chlorophyll and Methods of its Quantitative Determination"	Institute of Biology, Academy of Sciences, Moldavian SSR

80: W-30604, 7 July 1954

✓ Lying-down of crops grown on peat soils and how to prevent it. T. N. Gorkiy, M. V. Terent'eva, S. I. Litvinov, and N. I. Pankovskiy. *Vestnik Akad. Nauk Beloruss. S.S.R.* 1954, No. 3, 32-8. — Selection of the lying-resistant varieties of crops, proper mech. treatments and water regime of the soil, treating the seeds before sowing with the most active cultures of *Azotobacter*, and mineral nutrition of the plants are the main factors discussed. The stalks of grains in order to be able to support the grain ears have to contain certain amts. of cellulose and lignin, the formation of which in plants depends on the K and P contents of the soil. On peat soils 30-40 kg. granulated superphosphate and 30-100 kg. K/ha., put into the soil approx. 15-30 cm. deep, are sufficient to prevent crops from lying down, provided all other requirements are met. F. Wierbicki

(3)

Godnev, T. N.

Participation of glucose in the formation of the phytol and the phytol components of the chlorophyll molecule. T. N. Godnev and A. A. Shlyk. Doklady Akad. Nauk S.S.S.R. 94, 301-4 (1954). -- Introduction of  $C^{14}$ -labeled glucose (produced by growing tobacco plants in  $C^{14}$ -enriched atm.) into etiolated onion leaves, followed by strong illumination of the leaves, resulted in introduction of  $C^{14}$  activity into the pigments of the onion leaf: the activity (based on original level in glucose taken as 100%) was 0.60% in chlorophyll, 0.25% in xanthophyll, and 0.86% in carotene, which were sep'd. chromatographically. Hydrolysis of chlorophyll with 30% KOH in MeOH showed that its  $C^{14}$  activity was distributed in the ratio of 44.3% to the phytol and 55.7% in the chlorophyllin part of the structure. The transition from protoporphyrin to protochlorophyll is believed to consist of cleavage of the bond between the  $\gamma$ -C atom of the porphyrin and  $\alpha$ -C atom of propionic acid in position 6 of the 3rd pyrrole ring, with oxidation of the  $\beta$ -C atom in this side chain, and finally with hydrogenation of the vinyl group in position 4. The possibility of formation of protoporphyrin from glucose has been considered earlier; the biosynthesis of phytol is also believed to arise principally in glucose or a precursor. The phytol fragment appears to utilize material originating to the extent of some 75% from glucose, the rest arising from pyruvate as Me ester. G. M. Kopolintsev.

GOBENOV, T. K. and SHIHK, A. A.

"C<sup>14</sup> in the Study of the Biosynthesis of Chlorophyll," a paper presented at the  
Atoms for Peace Conference, Geneva, Switzerland, 1955

GODNEV, T.N.; SHLYK, A.A.

[C<sup>14</sup> in studying the biosynthesis of chlorophyll]C<sup>14</sup> v izu-  
chenii biosinteza khlorofilla. Moskva, 1955. 12 p.  
(MIRA 15:10)

(Carbon--Isotopes) (Chlorophyll)

GODNEV, T.N.; SUDNIK, N.S.

Effect of light on the accumulation of pigments in the leaves of  
one-year-old sweet cherry seedlings. Fiziol.rast.2 no.4:338-340  
Jl-Ag'55. (MIRA 8:12)

1. Belorusskiy Gosudarstvennyy universitet imeni V.I.Lenina,  
Minsk  
(Chromatophores) (Plants, Effect of light on)



GODNEV, T.N. professor; SHLYK, A.A.

New developments pertaining to chlorophyll biosynthesis in  
plants. Priroda 44 no.5:48-51 My '55. (MIRA 8:7)  
(Chlorophyll) (Biochemistry)

GODNEV, T. N.

USSR/ Biology - Ecology

Card 1/1      Pub. 22 - 46/54

Authors : Vinberg, G. G.; Godnev, T. N., Act. Memb. of Byeloruss. Acad. of Sc.;  
and Caponenko, V. I.

Title : Application of the P radio isotope in studying the fertilization of  
ponds

Periodical : Dok. AN SSSR 100/3, 575-578, Jan 21, 1955

Abstract : The role of phosphorous fertilizers as a means of increasing the fish  
productivity of ponds is explained. Methods of employing a phosphorus  
radio isotope during the study of pond fertilization are described.  
Some results obtained by means of these methods are listed. Five  
references: 2 USSR and 3 USA (1950-1953). Table, graph.

Institution : The V. I. Lenin Byelorussian State University

Submitted : November 4, 1954

SHLYK, A.A.; GODNEV, T.N., akademik, redaktor; ALEKSANDROVICH, Kh., tekhnicheskiiy redaktor

[Tagged atom method of studying the biosynthesis of chlorophyll]  
Method mechenykh atomov v izuchenii biosintaza klorofilla. Minsk,  
Izd-vo Akademii nauk BSSR, 1956. 298 p. (MLRA 9:11)

1. Akademiya nauk BSSR (for Godnev)  
(CHLOROPHYLL) (RADIOACTIVE TRACERS)

USSR / Soil Science. Mineral Fertilizers.

J-4

Abs Jour: Ref Zhur-Biol., No 8, 1938, 34422.

Author : ~~Codnev, T. M.~~ Torent'yov, V. M.  
Inst : AS Latv. SSR, and Institute of Biology, AS BSSR.  
Title : Experiments with Using Trace Elements on Peat-  
Bog Soils Under Conditions Prevalent in Bel-  
russian SSR.

Orig Pub: V sb.: mikroelementy v s.kh. i meditsine, Riga,  
AN LatvSSR, 1956, 135-141.

Abstract: Pre-sowing soaking-during 6-12 hours-of seeds of  
oats, barley and summer wheat in balanced solu-  
tion of major and minor elements (initial 1000-  
multiple solution of Hochland accompanied by the  
common 1/60 molar triple-salt nutritive mixture  
Ca<sup>++</sup>, Mg<sup>++</sup>, K<sup>+</sup>, SO<sub>4</sub><sup>++</sup>, NO<sub>3</sub><sup>-</sup>, H<sub>2</sub>PO<sub>4</sub><sup>-</sup>), has brought  
about - in field tests on peat and mineral soils

Card 1/2

USSR/Plant Physiology. Photosynthesis

I

Abs Jour : Ref Zhur-Biol., No 13, 1958, 58177

Author : Shlyk A. A., Godnev T. M., Totfarb R. M.,  
Lyakhnovich Ya. P.

Inst : Institute of Biology, Belorussian SSR

Title : On the Correlation Between the Biosynthesis of  
Chlorophyll a and Chlorophyll b During the Res-  
toration Process

Orig Pub : Byul. In-ta biol., AN BSSR, No 2, 1956, (1957),  
59-64

Abstract : Nicotiana alata, Syringa vulgaris, and Cerato-  
phyllum demersum plants were kept for a period  
of 24 hours in an atmosphere containing  $C^{14}O_2$ .  
The specific radioactivity of chlorophyll a:  
purified by double chromatography on glucose and  
paper, was found to be three times as high as

Card 1/2

USSR/Plant Physiology. Photosynthesis

I

Abs Jour : Ref Zhur-Biol., No 13, 1958, 58178

Author : Shlyk A. A., Godnev T. N., Lyakhnovich Ya. P.,  
Rotfarb R. M., Yunevich V. I.

Inst : Institute of Biology, Academy of Sciences  
Belorussian SSR

Title : A Study of the Restoration of Components of  
Chlorophyll during its Accumulation

Orig Pub : Byul. In-ta biol. AN BSSR, No 2, 1956, (1957)  
65-71

Abstract : The investigation of the restoration of chloro-  
phyll in the shoots of *Ceratophyllum demersum* L.  
was carried out under conditions of its conti-  
nued accumulation, with the help of marked atoms.  
In calculating the relative specific activity  
of chlorophyll the authors assumed that dicar-

Card 1/2

USSR / Microbiology. General Microbiology. Physiol- F-1  
ogy and Biochemistry.

Abs Jour: Ref Zhur-Biol., No 16, 1958, 71926.

Author : Godnev. T. N.; Rotfarb, R. M.  
Inst : Institute of Biology AS BSSR.  
Title : On the Leuko-Compound of Prodigiosin.

Orig Pub: Byul. In-ta biol. AN BSSR, vyp. 2, 1956 (1957),  
75-78.

Abstract: A prodigiosin pigment isolated from Bacillus  
prodigiosus in a pyridine solution was reversibly  
restored in a vacuum of 0.05 and 0.1 n. by as-  
corbic acid to a leuko-form which leads to a  
change of the absorption maximum from 507 to  
475 m $\mu$ . In the presence of oxygen, the leuko-  
form is oxidized back to prodigiosin. The authors

Card 1/2

8

Card 2/2

USSR/Plant Physiology. Photosynthesis

I

Abs Jour : Ref Zhur-Biol., No 13, 1958, 58179

Author : Godnev T. N., Shlyk A. A., Lyakhnovich Ya. P.  
Inst : ~~Institute of~~ Biology, Academy of Sciences  
Belorussian SSR

Title : Concerning the Problem of the Final Stage of  
Chlorophyll Formation

Orig Pub : Byul In-ta AN BSSR, No 2, 1956 (1957), 79-84

Abstract : Preliminary data on the final stages of chlorophyll formation have been received. A product similar to chlorophyll a is formed when ethylated barley leaves are kept at low temperatures (0 to 0.5°) under noncontinuous illumination. Its maximum absorption is within the 660mμ and 402 mμ range; from a sulfuric ether the substance is converted into an aqueous alkaline

Card 1/2



USSR/Plant Physiology. Photosynthesis

I

Abs Jour : Ref Zhur-Biol., No 13, 1958, 58180

Author : ~~Godnev T. N.~~, Akulovich N. K.

Inst : Institute of Biology, Academy of Sciences Belorussian SSR

Title : On the Effect of Ozone on the Correlation of a and b Chlorophylls in Corn Shoots and Young Branches of Lilac

Orig Pub : Byul. In-ta AN BSSR, No 2, 1956 (1957), 88-93

Abstract : Corn shoots and young lilac branches were grown in an atmosphere of ozone for a period of 10 days. Ozone which is a more active oxidizer than oxygen had no effect on the correlation of a and b chlorophylls in the leaves of the plants. A slight inhibition of the chlorophyll accumulation process was noted when the plants were placed in an ozone atmosphere for a period of 10 days.

Card 1/1

GODNEV, T. N.

Concentration of chlorophyll in chloroplasts of the cherry in dependence on the light regime. T. N. Godnev and N. S. Sudnik (V.I. Lenin State Univ., Moscow). *Rastenit* 3, 363-4 (1956).—Concn. of chlorophyll in terms of mols./chloroplast or cm<sup>2</sup>/unit vol. in leaves of 1-year-old *Prunus avium* are found to be the same as for other plants (cf. Euler, *et al.*, C.I. 29, 140A). Concn. of chlorophyll tends to rise with age of plant. The concn. is higher in shaded leaves than in exposed ones. O. M. Kozlov.

*GODNEU, T.N.*

USSR/Cultivated Plants - Technical, Oil, and Sugar Plants.

M-4

Abs Jour : Ref Zhur - Biol., No 3, 1958, 10891

Author : Godneu, T.N., Stasenka, N.N.

Inst :

Title : The Growth and Development of Hemp as Affected by the  
Light Regime and Factors Connected with It.

Orig Pub : Izv. AN EESR, ser. biol. n., 1956, No 4, 77-78

Abstract : In field experiments the light regime was varied by locating the plants differently over an area with the same sowing norm (120 kg./hectare). Ordinary sowing was tested, with the space between the rows at 8, 16, and 50 centimeters, and also belt sowings with the belts 16 centimeters wide and 50 centimeters between belts. Photometric measurements have demonstrated that increasing the space between rows intensifies the illumination received by each plant, but the consequent increase in the number of plants alters the conditions of growth. To avoid these secondary

Card 1/2

GODNEV, T. N.

✓ The structure of a chlorophyll-protein-lipoid complex.  
T. N. Godnev. *Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. Khim.*  
No. 5, 637-8 (1956).—The attachment of chlorophyll to  
protein layers in chloroplast grains is attributed to complex  
formation between the porphyrin nuclei of chlorophyll and the  
amino acids. Expts. are described on shifts in light absorp-  
tion of H<sub>2</sub>O solns. of chlorophyllide and albumin. B. P.

*Godnev, T. N.*

USSR/Physical Chemistry - Molecule, Chemical Bond.

B-4

Abs Jour: Referat. Zhurnal Khimiya, No 2, 1958, 3537.

Author : T.N. Godnev, P.V. Yefremova, L.A. Kravtsov.

Inst : Academy of Sciences of USSR.

Title : Influence of Some Acid and Alkaline Substances on Absorption Spectra of Chlorophyll and Chlorophyllide.

Orig Pub: Izv. AN SSSR. Ser. fiz., 1956, 20, No 5, 540-546.

Abstract: The absorption spectrum (AS) of chlorophyll (I) has two maxima (M) in the visible range: 415 and 658 m $\mu$  in benzene and 429 and 662 m $\mu$  in ether. If a fatty acid was added to the I solution, a rise of the absorption intensity of the short wave M (SWM), as well as an insignificant hypsochromic shift of the long wave M (LWM) (of 2 to 4 m $\mu$  at the addition of palmitic acid and of 2 m $\mu$  at the addition of acetic acid) takes place in proportion to the acid concentration rise. The AS of chlorophyllide (II), produced of I by the chlorophyllase ferment, has maxima at 402

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USSR/Physical Chemistry - Molecule, Chemical Bond.

Abs Jour: Referat. Zhurnal Khimiya, No 2, 1958, 3537.

and 656  $m\mu$  in aqueous solution, If hydrochloric acid was added to the II solution, a decrease of LWM is observed in proportion to the acid concentration rise. Starting from the HCl concentration of 0.0013 n., the LWM begins to split, maxima at 648 and 670  $m\mu$  are clearly revealed at 0.0015 n., and if the HCl concentration was raised further, M at 648  $m\mu$  disappears and the intensity of the M at 670  $m\mu$  increases. This is connected with the removal of magnesium from the II molecule and the formation of pheophorbide. At the action of dihydropyridic aminoacids - aspartic (III) and glutamic (IV) acids - the intensity of the SWM decreases and it shifts a little down and the LWM (at 0.001 n., of IV) splits at first into maxima at 642 and 675  $m\mu$ . The intensity of the 642  $m\mu$  M rises and the M at 675  $m\mu$  disappears gradually in proportion to the acid concentration rise. The intensity of the 642  $m\mu$  M starts also to drop beginning from the IV concentration of 0.2 n. These changes are connected with the

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USSR/Physical Chemistry - Molecule, Chemical Bond.

B-4

Abs Jour: Referat. Zhurnal Khimiya, No 2, 1958, 3537.

leaves. A surmise about the formation possibility of aggregated chlorophyll states in living leaves was expressed during the discussion.

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GODNEV, T.N.; SUDNIK, N.S.; SYUBAROVA, E.P.

Periodical fertilizing of fruit trees in the light of the theory  
of phasic development. Uch.zap.BGU no.26:153-157 '56. (MIRA 10:9)  
(Fertilizers and manures) (Fruit culture)



GODNEV, T.W. LISHNEVICH, S.V.; ZAKHARIN, J.F.

Chloroplast structure and chlorophyll concentration in some aquatic  
plants. Uch.zap.BGU no.26:158-160 '56. (MLHA 10:9)  
(Pondweed) (Chlorophyll) (Chromatophores)

1977, 1.1.

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at the International Symposium on the Origin of Life, Moscow, 17-24 Aug 1977.

GODNEV, T. N.

CHERKASOVA, L.S., prof.; GODNEV, T.N., akademik, red.; MANINA, L., red. izd-va;  
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[Biochemistry of trauma (tissue injuries, bone fractures and their complication by suppurative infection)] Biokhimiya travmy (pri raneniyakh miagkikh tkanei, perelomakh kosti i ikh oslozheniyakh gnoynoi infektsiei. Minsk, Izd-vo Akad. nauk BSSR, 1957. 191 p.

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Interrelationship of the biosynthesis of chlorophyll a and chlorophyll  
b in the restoration process. Biul. Inst. biol. AN BSSR no.2:59-64  
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(MIRA 11:2)

(Chlorophyll)